remain 4 or 8 hours, according to the tint desired (a light tint interfering least with the details and sharpness of outline). I have been able to obtain more delicately coloured specimens, and more clearly defined structure by the use of glycerine than by any other method. The sections are then washed first in pure water, afterwards in strong alcohol, in which they are allowed to remain about an hour, and are now ready for preparation with turpentine, according to Clarke's method; they may be put up in Canada balsam, or, as I have found very advantageous, in thick colourless copal varnish, which often preserves minute details better than balsam; although Stilling and others have found much fault with Clarke's method of preparation, on account of the too great transparency it sometimes gives, I am convinced that, with practice and some slight modifications, it is the only one suited to the minute study of the cord, other methods seeming to me, after thorough trial, quite unsatisfactory as compared with Clarke's. As a hardening material, I have often employed chronic acid with considerable advantage; but when colouring matter is used, alcohol is most suitable, and is certainly much easier to succeed with."

In conclusion we may bestow praise on the four plates which illustrate the memoir, and which we are told were etched upon the copper by the author himself. They are evidently faithful likenesses of the preparations from which they are drawn, which more than counterbalances any little want of artistic elegance in their execution. J. J. W.

ART. XVIII.—*Researches upon the Venom of the Rattlesnake; with an Investigation of the Anatomy and Physiology of the Organs Concerned.* By S. WEIR MITCHELL, M. D., Lecturer on Physiology in the Philadelphia Medical Association. Published by the Smithsonian Institution, January, 1861. Pp. 145. With twelve wood-cuts.

THE industry, perseverance, and experimental skill displayed in this monograph reflect much credit upon the author. From the preface we learn that "during a large part of two years he has given to this work almost all the leisure which could be spared from the everyday exactions of his regular professional duties."

The essay is divided into seven chapters. The first contains some general observations upon the habits of the Crotalus when in captivity. In the second is described the anatomy of the venom apparatus. The third treats of the physiological mechanism of the bite of the Crotalus. The fourth is devoted to the consideration of the physical and chemical characters of the venom. In the fifth, sixth, and seventh chapters, the toxicology of the venom of the Crotalus is considered. Chapter eighth treats of Crotalus poisoning in man.

The last four chapters more particularly commend themselves to the practitioner of medicine, who is occasionally called upon to treat cases of rattlesnake bite and its dreadful constitutional effects.

From his numerous experiments upon different animals, Dr. Mitchell concludes—

"1st. That the heart becomes enfeebled shortly after the bite. This is due to direct influence of the venom on this organ, and not to the precedent loss of the respiratory function. Notwithstanding the diminution of cardiac power, the heart is usually in motion after the lungs cease to act, and its tissues remain for a time locally irritable. The paralysis of the heart is, therefore, not so complete as it is under the influence of upas or corroval.

"2d. That in warm-blooded animals artificial respiration lengthens the life of the heart, but does not sustain it so long as when the animal has died by woorara or decapitation.

"3d. That in the frog the heart-acts continue after respiration has ceased, and sometimes survive until the sensory nerves and the nerve-centres are dead, the motor nerves alone remaining irritable.

"4th. That in warm-blooded animals respiration ceases, owing to paralysis of the nerve-centres.

"5th. That the sensory nerves, and the centres of nerve power in the medulla spinalis and medulla oblongata, lose their vitality before the efferent or motor nerves become affected.

"6th. That the muscular system retains its irritability in the cold-blooded animals, acutely poisoned, *for a considerable time after death.*

"7th. That the first effect of the venom being to depress the vital energy of the heart, and nerve-centres, a resort to stimulants is clearly indicated, as the only rational mode of early constitutional treatment."

With regard to the condition of the blood in cases of Crotalus poisoning, the author informs us "that in animals which survive the poisoning for a time, the blood is so altered as to render the fibrin incoagulable. Experiments in and out of the body have given proof that this change is gradual, and that the absence of coagulation is not due to checked formation of fibrin, but to alterations produced by the action of the venom in that fibrin which already exists in the circulating blood. The influence thus exerted is of a putrefactive nature, and imitates in a few hours the ordinary results of days of change. It is probably even more rapid within the body, on account of the higher temperature of the economy. The altered blood retains its power to absorb gases, and thus to change its own color. The blood-corpuscles are unaffected in acute poisoning by Crotalus venom, and are rarely and doubtfully altered in the most prolonged cases which result fatally. The contents of the blood-globules of the guinea-pig can be made to crystallize, as is usual after other modes of death."

Concerning the antidotes to be employed, or the mode of treatment to be instituted for the purpose of counteracting the deadly effects of the rattlesnake venom, Dr. Mitchell's researches afford us no satisfactory information. After criticizing and throwing doubt upon the efficacy of the various remedies from time to time recommended for the cure of Crotalus poisoning, he says:—

"When a person has been bitten, it would be proper slightly to intoxicate him, then to loosen the previously applied ligature or cup, and, watching the pulse, and relaxing or tightening the ligating cord, to control thus the inlet of the poison, with the aid of the stimulus destroy its effects in detail. Finally, the stimulus should be most cautiously and by degrees abandoned, with continued regard to the state of the system."

"It sometimes happens," he continues, "that the physician finds it impossible to produce stimulation in the presence of so potent a sedative as the venom. When this is the case, it is possible that absorption does not occur with sufficient rapidity, or, at all events, that cases may occur where it is necessary to stimulate fully and suddenly.

"Under these circumstances, I would recommend inhalation of the fumes of warm alcohol, or even of ether, if used with caution.

"While advocating the employment of stimuli as rational therapeutic means of meeting a most obvious indication, it is proper to admit that cases have been and will be encountered, in which the dose of venom has been so great that no remedy is of any avail. Such, however, must be rare, and it is, on the whole, more than probable that the danger from the bite of the rattlesnake has been over-estimated, and that in a large majority of cases the patient would recover, even if unassisted by any remedy.

"Where stimulants are of any use, the patient commonly recovers without any difficulty. In some cases, however, which attain to the stage of alteration in the blood, we have to deal with conditions which are also present in other cases of putrefactive poisoning, but for which we have no remedies of well-determined power. Possibly, tonics, astringents, and continued stimulation might be of some value in supporting the strength until the blood recovers its normal condition."

A copious bibliographical record of the subject, derived chiefly from Soubeiran's Bibliography, is appended to the "Researches." Another appendix contains "An Enumeration of the Genera and Species of Rattlesnake, with Synonymy and References," by Mr. E. D. Cope. J. A. M.